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Final Phase II Pre-Design
Studies Work Plan

Operable Unit 1
North Bronson Industrial Area
Bronson, Michigan

P R E P A R E D F O R

North Bronson PRP Group



infrastructure, buildings, environment, communications

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ENVIRONMENTAL

Subject:
Final Phase II Pre-Design Studies Work Plan, Operable Unit 1, North Bronson
Industrial Area Site, Bronson, Michigan
ARCADIS Project No. WI000771.0002.5F01

Dear Ms. Nguyen:

SOUTHFIELD
18 July 2002

Enclosed please find 2 copies of the Final Phase II Pre-Design Studies Work Plan for Operable Unit 1 (OU 1) of the North Bronson Industrial Area Site in Bronson, Michigan. The Phase II Pre-Design Studies Work Plan has been prepared by ARCADIS G&M, Inc. on behalf of the North Bronson OU 1 Potentially Responsible Party (PRP) Group (Bronson Plating Company, ITT Industries, Inc., L.A. Darling Company, and Scott Fetzer Company). Submittal of the Phase II Pre-Design Studies Work Plan is in accordance with Section III, Task 1 of the Statement of Work for OU 1 (Appendix D of the Consent Decree).

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If you should have any questions or comments regarding this submittal, please do not hesitate to contact us at your convenience.

Sincerely,

ARCADIS G&M, Inc.

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RAF

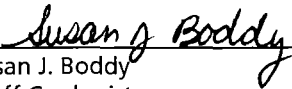
Enclosures -2

Copies:
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Part of a bigger picture

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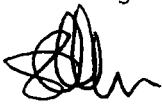
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**Final Phase II Pre-Design
Studies Work Plan**

Operable Unit 1
North Bronson Industrial Area
Bronson, Michigan

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Introduction

On behalf of the North Bronson Potentially Responsible Parties (North Bronson PRP Group), ARCADIS G&M, Inc. has prepared this *Phase II Pre-Design Studies Work Plan* (Work Plan) for Operable Unit 1 at the North Bronson Industrial Area Superfund Site (United States Environmental Protection Agency [USEPA] Facility Identification Number MID005480900), located in Bronson, Michigan (Site).

The primary objective of the scope of work is to collect additional data necessary to confirm the interpretations that were presented in the report titled *Draft Conceptual Site Model* (ARCADIS G&M, Inc. 2002). The scope of work was developed based on the results of a meeting on April 23, 2002 and a conference call on July 10, 2002 between representatives of the North Bronson PRP Group Technical Committee, the USEPA, the Michigan Department of Environmental Quality (MDEQ), and ARCADIS.

This Work Plan was prepared to address the requirements outlined in the Consent Decree filed in the United States District Court for the Western District of Michigan, Southern Division, United States of America vs. Bronson Plating Company, et al., entered on February 29, 2000.

The data to be collected in accordance with this Work Plan will be utilized in conjunction with data obtained previously during the Remedial Investigation (RI) to execute an appropriate Remedial Design (RD) and implement the Remedial Action (RA) for the Site, as required in the Record of Decision (ROD), which is included as Attachment A of the Consent Decree.

Objective

Because the majority of the soil borings completed during the pre-remedial investigation (Pre-RI), RI, and Pre-Design Studies (PDS) did not penetrate deep enough to characterize the stratigraphy and groundwater-quality conditions in the upper aquifer in the Western Lagoon Area, there is uncertainty regarding stratigraphic interpretations upon which the revised conceptual model is founded:

- The lateral continuity and thickness of the upper silt lenses require further characterization to determine whether they comprise a locally continuous layer that may constitute a vertical barrier to groundwater flow and contaminant migration beneath the Western Lagoon Area.
- The lateral continuity and thickness of the silty sand layer require further characterization to determine the stratigraphic relationship with the underlying till aquitard.

- The degree of hydraulic communication between the upper aquifer and County Drain No. 30 (CD-30) requires additional characterization to establish whether potential discharge to the drain prevents downgradient migration of constituents of concern (COCs) throughout the vertical profile of the upper aquifer.

Consequently, additional hydrogeologic and groundwater-quality data are required to verify the revised conceptual model and establish the potential requirements for the hydraulic control component of the groundwater remedy.

Statement of Work

As a result of our meeting with the USEPA and MDEQ, it was agreed that the following confirmatory phase of site characterization and hydrologic data collection is required to address the data gaps and assess the broader interpretations of the revised site conceptual model. It was also agreed the results of the Phase II PDS would be used to determine if additional pre-design studies were required to move forward with the design of the soil and groundwater remedies for Operable Unit 1.

The proposed Phase II PDS scope of work consists of the following elements:

- Installation of up to four deep soil borings to confirm the stratigraphy of the upper aquifer in the Western Lagoon Area and the moraine deposits to the north of CD-30.
- Vertical aquifer profiling during soil boring installation to characterize groundwater quality and guide the placement of monitoring wells.
- Installation of up to four shallow and four deep monitoring wells to characterize groundwater quality and provide hydraulic data necessary to characterize vertical and horizontal groundwater flow conditions adjacent to CD-30.
- Groundwater sampling of the proposed monitoring wells and Monitoring Well MW-28 to further characterize the groundwater quality in the upper aquifer.
- Performance of aquifer tests (slug tests) on the proposed monitoring wells to estimate hydraulic conductivity of the aquifer. Slug tests will also be repeated at three existing monitoring wells to verify initial estimates and evaluate method repeatability.

- Quarterly site-wide, synoptic groundwater and surface-water elevation monitoring to characterize the seasonal variation of upper aquifer groundwater flow conditions and degree of hydraulic communication between the upper aquifer and CD-30.
- Preparation of a technical memorandum summarizing the results of the initial Phase II PDS work.

Approach

The scope of the proposed confirmatory Phase II PDS work depends on whether the stratigraphy of the upper aquifer is consistent with the original conceptual model presented in the RI and PDS reports or the revised conceptual site model that was presented to the USEPA and MDEQ. Based on the meeting, it was agreed that the USEPA and MDEQ would provide geologists to observe the drilling activities so that all parties could reach agreement on stratigraphic interpretations and well placements in the field.

If the upper silt lenses and silty sand layers are connected to the underlying till aquitard, as in the original model, it is anticipated that the number and depth of proposed borings and monitoring wells will be limited. If the upper aquifer is thicker and more stratified, as indicated by the revised conceptual model, it is anticipated that the full scope of proposed soil boring and monitoring well installation will be necessary.

The following paragraphs present the approach to determine the actual scope of work that will be implemented during the Phase II PDS.

The remaining sections describe the methods of the proposed scope of work and provide a schedule for implementation of the Phase II PDS.

Soil Borings

Up to four deep borings are proposed to further characterize the stratigraphy of the upper aquifer and assess the accuracy of the revised conceptual model interpretations. The proposed boring locations are shown on Figure 1.

The total depth and number of the proposed borings are dependent on the stratigraphy encountered in the field. The proposed soil borings will be advanced approximately 5 feet into the top of the till aquitard. If the upper silt lenses and silty sand layer are connected to the till, it is anticipated that the borings will be advanced approximately 50 feet below ground surface. However, if the upper aquifer is present beneath the upper silt lenses and silty sand layer, the borings could be advanced to depths as great as 60 to 70 feet below ground surface.

Up to three soil borings will be installed in the Western Lagoon Area to characterize the stratigraphy of the upper aquifer to the top of the till aquitard at the following locations:

- Near Monitoring Wells MW-32S/I.
- Approximately 200 feet west of Monitoring Well MW-28.
- Approximately 100 feet north and approximately 200 feet west of Monitoring Wells MW-33S/I on the northern side of CD-30 (a contingency boring).

The contingency boring will be installed if the upper aquifer exists beneath the upper silt lenses and the silty sand layer, based on the results of the proposed boring to be installed near Monitoring Wells MW-32S/I. If the upper aquifer is present beneath the upper silt lenses, the final location of the contingency boring will be determined in the field based on site logistics and access constraints. The objective of the contingency boring placement is to verify groundwater quality in a general downgradient direction from Monitoring Wells MW-32S/I on the north side of CD-30, while minimizing the potential influence of a mixing zone in the vicinity of CD-30. One deep soil boring is proposed north of CD-30 in the moraine deposits to assess the presence and characterize the stratigraphy of the upper aquifer and to collect hydraulic data necessary to refine groundwater flow interpretations north of CD-30:

- Approximately 500 feet north of Monitoring Well MW-28.

The borings will be installed using sonic drilling methods and continuous soil sampling techniques to provide detailed lithologic and stratigraphic data.

Monitoring Well Installation

Depending on the results of the soil boring investigation, up to eight monitoring wells will be installed at the four proposed locations. The decision to install monitoring wells at the proposed locations will be determined in the field based on stratigraphy and groundwater-quality data collected through vertical profiling of the groundwater in the upper aquifer.

- The stratigraphy of the upper aquifer will be interpreted using continuous soil sampling at each proposed boring location to evaluate the potential presence of upper aquifer matrix beneath the upper silt lenses and silty sand layer.
- Vertical aquifer profiling will be performed at 5-foot intervals throughout the saturated section to assess potential chlorinated volatile organic compound (CVOC) impacts and to select well-screen placement for monitoring wells in the

upper aquifer. A mobile laboratory will be employed to screen groundwater samples for target CVOCs.

The final number, locations and depths of monitoring wells will be determined in the field by the site geologist and USEPA and MDEQ representatives. These decisions will be based on the stratigraphic and vertical profiling results. The following guidelines will be used for selecting depth intervals for well installation:

- If the upper silt lenses are connected to the silty sand and till aquitard, or if the upper silt lenses are not present and the silty sand is connected to the till aquitard; then it is anticipated that only two shallow monitoring wells will be required. One well would be located approximately 200 feet west of Monitoring Well MW-28, and one approximately 500 feet north of Monitoring Well MW-28. The shallow wells are anticipated to be installed with screens set at depths approximately 10 to 40 feet below ground surface.
- If the upper silt lenses are present and only the silty sand layer is connected to the aquitard, it is anticipated that monitoring wells will be installed with screens placed above the silty sand layer, or approximately 20 to 40 feet below ground surface. In this case, shallow monitoring wells will be installed at each of the four proposed locations. Therefore, a total of four shallow monitoring wells would be installed.
- If the upper aquifer is present beneath the silty sand layer, deep monitoring wells will be installed at intervals between approximately 40 to 70 feet below ground surface at each location. Therefore, a total of eight monitoring wells, four shallow and four deep wells, would be installed.
- For all well placements, if a well is to be placed in a zone of the upper aquifer that has a significant thickness, then the vertical profiling results will be used to select well depth within that zone. If CVOCs are determined to be present in groundwater samples from the zone, then the well would be set at the maximum concentration interval. If CVOCs are not present, then the well would be set at the base of the zone, which would be above either the top of the silty sand layer or the top of the till aquitard.

Groundwater Sampling

Groundwater samples will be collected from the proposed monitoring wells and Monitoring Well MW-28 using low-flow (minimal drawdown) methods in accordance with Section B.5.3.8 of the *Field Sampling and Quality Assurance Plan (FSQAP)*. Depending on the final number of monitoring wells installed, between three and nine

wells will be sampled and analyzed for the complete target analytical list presented in the FSQAP.

In addition, groundwater samples will also be analyzed for biogeochemical parameters including terminal electron acceptors (dissolved/total iron, dissolved/total manganese, nitrate/nitrite, and sulfate/sulfide) and dissolved gases (ethane, ethene, methane, and carbon dioxide) to assess natural attenuation conditions.

The results of the proposed groundwater sampling will be used to assess the groundwater-quality conditions beneath the Western Lagoon Area.

Synoptic Groundwater and Surface-Water Elevation Measurements

Quarterly synoptic groundwater and surface-water elevation measurements will be obtained from the Western and Eastern Lagoon area monitoring wells, existing staff gauges, proposed monitoring wells, and select monitoring wells south of Operable Unit 1. Depending on the final number of monitoring wells installed, between 47 and 53 wells will be gauged as follows:

- **Proposed wells:** two to eight wells, depending on lithology and stratigraphy.
- **Staff gauges:** SG-1 and SG-2
- **Western Lagoon Area:** MW-6S, MW-7S, MW-8S/D, MW-9S, MW-26, MW-28, MW-29, MW-30, MW-31 MW-32S/I, and MW-33S/I.
- **Eastern Lagoon Area:** PZ-4, MW-11S, MW-12S/D, MW-13S/D, MW-15S/D, MW-16S/D, MW-17S/D, MW-18, MW-23, MW-25, MW-34S/I, and MW-35S/I.
- **South of Operable Unit 1:** MW-5S/D, MW-10S/D, MW-3S, MW-24, PZ-5, PZ-6S/D, and PZ-7S/D.

The results of the quarterly synoptic monitoring, in conjunction with the stratigraphic information, will be used to refine the interpretation of site-wide groundwater flow conditions and evaluate the degree of hydraulic communication between the upper aquifer and CD-30.

Methods

Rotosonic Drilling

Rotosonic drilling techniques are performed using a specialized drill rig equipped with a sonic drill head. Rotosonic drilling occurs by creating a vibration on the advancing drilling rods that enables the rods to move through soil with a minimum of disturbance.

Continuous soil samples will be collected using a sonic drill rig by the following method:

- A 4-inch diameter, 10-foot long stainless-steel core barrel will be advanced into undisturbed soils.
- The soils will be collected in the interior of the core barrel as it advances.
- A 6-inch diameter casing will be advanced over the outside of the 4-inch core barrel, preventing collapse of the hole.
- The core barrel will be removed from the boring and placed into a disposable plastic sleeve.
- The soil sample will be ejected from the core barrel into the plastic sleeve by applying vibration and air pressure (if necessary).
- The plastic sleeve will be turned over to the on-site geologist for lithologic description.
- The soil sample core will be field-screened using a flame-ionization detection (FID) in accordance with the FSQAP, Section B 5.3.1
- The process will be repeated by advancing the core barrel until the borehole reaches the desired depth.

The core barrel can be advanced at any interval up to 10 feet using the technique described above. In addition to the vibration created by the drill head, it is also possible to rotate the drill rods, which by adding water, allows for rock core drilling. Water is typically only added for cooling and lubrication while advancing the 6-inch diameter casing.

Decontamination of drilling tools will be conducted according to Section B5.3.1 of the FSQAP.

Soil descriptions will be recorded according to Section B5.3.10 of the FSQAP and will include grain size and distribution, sorting, color, moisture content, and odor.

No soil samples are intended to be collected for laboratory analysis.

Vertical Aquifer Profiling

Vertical aquifer profiling will be conducted while drilling the deep borings to allow groundwater sampling and characterization. Groundwater samples will be collected beginning at a depth 5 feet below the existing monitoring well screens (i.e., near Monitoring Wells MW-32S/1) or at the water table for new boring locations. Groundwater samples will be collected in the following manner:

- Prior to groundwater sampling, all reusable equipment will be decontaminated in accordance with the procedures outline in Section B5.3.10 of the FSQAP. To minimize the potential for cross-contamination, dedicated polyethylene tubing will be utilized for each sample collected.
- A temporary well, consisting of a 2-foot long stainless-steel 0.010-foot slot-size screen, will placed through the 6-inch casing to the depth of the former core barrel.
- The temporary well will be advanced 2 feet into the saturated section.
- A packer will be installed less than 1 foot above the top of the screen and inflated to prevent water within the casing from entering the well screen.
- Water will be withdrawn from the screen using a submersible bladder pump.
- The discharge from the pump will be connected to a flow-through cell with instrumentation that will allow a series of field measurements, including temperature, pH, specific conductance, dissolved oxygen, oxidation/reduction potential, and turbidity to be recorded from the water stream. The pumping rate will be set between 100 and 500 milliliters per minute (mL/min) to minimize drawdown within the well.
- These parameters will be recorded every five minutes until three consecutive readings within 10 percent of the previous reading are observed. If parameter stabilization has not occurred after one hour, a sample will be collected.

- After the field parameters stabilize, the sample tubing will be removed from the flow-through cell, and samples will be collected for on-site laboratory analysis for CVOCs (see mobile laboratory section below).
- The soil boring will be advanced 5 feet (i.e., 3 feet below the bottom of the temporary well screen interval), and the process will be repeated until the till aquitard is penetrated approximately 5 feet.

On-Site Mobile Laboratory Field Screening

Laboratory analyses for CVOCs will be conducted for vertical profile groundwater samples. The samples will be analyzed using USEPA Method 8260. Analytical methods will be consistent with those specified in the FSQAP. Laboratory detection limits will be consistent with MDEQ Operational Memorandum No. 6, Revision 6 (January 12, 2001).

The mobile laboratory analysis will be performed by an MDEQ-certified laboratory, New Age/Landmark of Benton Harbor, Michigan. The mobile laboratory will utilize the following equipment: Hewlett Packard 5890GC with a 5970 mass selective detector (MSD), Tekmar ALS2016 16-position autosampler, Tekmar LSC2000 Purge and Trap Controller, and computer equipped with Chemstation software. A copy of New Age/Landmark's field procedure for analyzing CVOCs using USEPA Method 8260 is included as Appendix A. The field procedure presents guidelines for proper equipment calibration, sample preparation, and sample analysis conducted in the mobile laboratory.

Field quality assurance/quality control (QA/QC) samples for the groundwater sampling activities will include field duplicates and trip blanks. The collection frequencies and manner of preparation, handling, and shipment for field QA/QC samples are discussed in the FSQAP. Field duplicates will be submitted for the identical laboratory analyses ordered for the corresponding investigative samples and will be sent to the laboratory as "blind" duplicates (i.e., sampling location not identified). Trip blanks will be analyzed for target compound list (TCL) volatile organic compounds (VOCs) only.

Monitoring Well Installation

Monitoring wells will be installed and developed as described in Section B5.3.4 of the FSQAP. Note that shallow and deep wells will be constructed using 2-inch internal diameter Schedule 40 polyvinyl chloride (PVC) risers and 5-foot long, wire-wrapped 0.0070-inch slot stainless-steel screens.

Well construction materials vary from those specified in the FSQAP because a 5-foot, wire-wrapped, 0.0070-inch slot stainless-steel screen will be used. The wire-wrapped screen is recommended because it provides improved hydraulic characteristics compared to PVC slotted screens with the same slot size.

Monitoring Well Gauging

Static groundwater measurements will be recorded from selected monitoring wells on a quarterly basis. Groundwater levels will be measured from a consistent point on each well, on the top of the well casing (not on the protective cover), using a clean water-level measuring indicator to an accuracy of ± 0.01 foot. A notch or mark engraved on the north side of each well casing during well installation serves as a reference point from which all groundwater-level measurements will be made. The general procedures to be followed for the collection of groundwater-level measurements and well depths from the monitoring wells are discussed in Section B.5.3.7 of the FSQAP.

Groundwater Monitoring

The monitoring wells will be sampled approximately two weeks after well installation and development have been completed, using minimal drawdown (low-flow) sampling procedures.

Prior to sample collection, monitoring wells will be allowed to vent and equilibrate to atmospheric conditions. Monitoring wells will be purged at a flow rate between 100 and 500 mL/min, using a variable-flow bladder pump and dedicated polyethylene tubing. Field measurements of temperature, pH, specific conductance, dissolved oxygen, oxidation/reduction potential, and turbidity will be recorded at approximately 5-minute intervals during well purging, and well evacuation will continue until these parameters stabilize in accordance with the criteria presented in the FSQAP. Field parameters will be measured using a flow-through cell. The purge rates will be set to minimize drawdown within the wells.

Section 2.4.2 of the *Pre-Design Studies Work Plan* provides additional detail regarding sample collection procedures. The procedures for field measurement of temperature, pH, specific conductance, dissolved oxygen, oxidation/reduction potential, turbidity and organic vapors are described in the equipment Standard Operating Procedures (SOPs) in Attachment A of the FSQAP.

Upon collection, groundwater samples will be immediately placed into laboratory-supplied, pre-preserved containers and placed in a cooler on ice. The groundwater

samples will be submitted to the project laboratory under proper chain-of-custody procedures.

Field QA/QC samples for the groundwater sampling activities will include field duplicates and trip blanks. The collection frequencies and manner of preparation, handling, and shipment for field QA/QC samples are discussed in the FSQAP. Field duplicates will be submitted for the identical laboratory analyses ordered for the corresponding investigative samples and will be sent to the laboratory as “blind” duplicates (i.e., sampling location not identified). Trip blanks will be analyzed for TCL VOCs only.

Analytical Parameters

Severn Trent Laboratories, Inc. (STL) will conduct laboratory analysis of groundwater samples for the target analytical list including:

- TCL VOCs.
- Target analyte list (TAL) metals.
- Total cyanide.

In addition, groundwater samples will be collected for laboratory or field analysis of the following biogeochemical parameters including terminal electron acceptors (total/dissolved iron, total/dissolved manganese, nitrate/nitrite, and sulfate/sulfide) and dissolved gases (ethane, ethane, methane, and carbon dioxide).

Due to their sensitive nature, the following biogeochemical parameters will be analyzed in the field immediately after sample collection using field test kit methods.

Analyte	Detection Range		Method
	Low	High	
Dissolved iron	0.05	10,000	1,10-Phenanthroline
Dissolved manganese	0.15	7.5	Periodate
Nitrite	0.025	250	Azo dye formation

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Sulfide	0.05	10,000	Methylene blue
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Note:

Milligrams per liter (mg/L).

The field analysis for the analytes listed above will be performed using Chemetrics' visual test kits in accordance with the manufacturer's methods and procedures (Chemetrics 2002). Two or more tests are required to evaluate the concentration of each analyte; therefore, field tests will start with the low-range for each analyte and progress to the highest applicable range.

The remaining biogeochemical parameters will be quantified in the project laboratory by STL:

- Total iron.
- Total manganese.
- Nitrate.
- Sulfate.
- Ethane.
- Ethene.
- Methane.
- Carbon dioxide.

Total iron, total manganese, nitrate, and sulfate will be analyzed using the laboratory analytical methods prescribed in the FSQAP. The dissolved gases including ethane, ethene, methane, and carbon dioxide will be analyzed by STL using USEPA Method Series 200 through 400.

Aquifer Testing

In-situ aquifer testing (slug testing) will be performed on all of the new monitoring wells to estimate the saturated hydraulic conductivity of the formation. In addition,

slug-testing will also be performed on three existing monitoring wells from the Western Lagoon Area for QA/QC purposes.

Slug testing will be performed in accordance with the methods and procedures outlined in Section B5.3.9 of the FSQAP, except that only slug-out test results will be used for the purpose of estimating hydraulic conductivity in monitoring wells where the screened-section is not completely submerged.

Investigative-derived Waste Handling

Soil cuttings generated during advancement of the soil borings will be contained in United States Department of Transportation (DOT)-approved drums and staged on-site for eventual consolidation into the Western Lagoon Area. Groundwater recovered during development of the monitoring wells will also be containerized, either in DOT-approved drums or 500-gallon poly tanks, for eventual discharge to the City of Bronson Wastewater Treatment Plant (WWTP). Detailed procedures for management of investigation-derived waste are contained in Section B5.4 of the FSQAP and will conform to applicable federal and Michigan regulations.

Health and Safety

A site-specific health and safety plan was prepared prior to the PDS investigation and included as Appendix C of the FSQAP. *The Health and Safety Plan* will be implemented and overseen as discussed in Section B3.2 of the FSQAP. Personnel identified in the plan have been updated to reflect the change in management of the project. Personnel updates are provided in Appendix B.

Surveying

Horizontal coordinates and vertical elevations of the ground surface and top of casing for each new monitoring well and soil boring will be surveyed by a registered land surveyor and transferred onto the Site base map. In addition, three existing monitoring well locations will be included in the survey to verify the accuracy of the new elevations and coordinates. Elevations will be measured to the nearest 0.01 foot, relative to mean sea level, and the horizontal locations will be surveyed relative to Michigan State Plane coordinates. All well locations will be marked and included on the topographic base map.

A notch or mark will be engraved on the north side top of each well casing to record the survey point, and future groundwater-level measurements will be made in reference to this point.

Reporting

The results of the Phase II PDS field activities will be summarized in a technical memorandum. The objective is to use the additional hydrogeologic and groundwater-quality data to assess whether the revised conceptual site model accurately describes the site conditions or if the previous site model presented in the RI report and PDS report is still valid.

The technical memorandum will summarize the results of the soil boring investigation, vertical aquifer profiling, monitoring well installation, groundwater sampling, and the first round of site-wide quarterly synoptic elevation measurements. The technical memorandum will include the following information and analyses:

- Raw data including soil boring logs, monitoring well construction and development forms, analytical reports derived from vertical aquifer profiling and groundwater sampling, and field elevation measurements.
- Tabulated field measurements including well construction specifications, field geochemical parameters (i.e., temperature, pH, specific conductance, dissolved oxygen, oxidation/reduction potential, turbidity, and biogeochemical field measurements), and groundwater-elevation and surface-water elevation measurements.
- Stratigraphic cross sections will be reviewed and revised using the additional data.
- Groundwater flow maps will be generated based on the first round of synoptic elevation measurements to evaluate site-wide groundwater flow directions and horizontal gradients.
- Vertical hydraulic gradients will be calculated and evaluated to assess whether CD-30 is a gaining or losing stream adjacent to the Western and Eastern Lagoon areas and to assess the potential for migration of COCs beneath CD-30.

The results of the Phase II PDS activities will be evaluated to determine whether the revised conceptual site model describes the site hydrogeologic system sufficiently to proceed with the design of the soil and groundwater remedies for Operable Unit 1 or if additional data collection activities are warranted. The analysis will include the following elements:

- Identification of potential data gaps and evaluation of potential additional data collection strategies.

- Evaluation of the potential requirements of the groundwater control remedy in light of the revised conceptual site model stratigraphy, groundwater flow, and groundwater-quality data.

Two copies of the Phase II PDS memorandum will be submitted to the USEPA and the MDEQ, in accordance with the schedule contained in this Work Plan.

The results of subsequent quarterly synoptic elevation measurements will be provided in three separate data transmittal memoranda. The quarterly data transmittals will include tabulated elevation measurements and associated groundwater flow maps. A narrative will discuss the resulting groundwater flow directions, horizontal and vertical hydraulic gradients, and evaluate the communication between the upper aquifer and CD-30. Two copies of the quarterly data transmittal memoranda will be submitted to the USEPA and the MDEQ, in accordance with the schedule contained in this Work Plan.

Schedule

The preliminary project schedule for implementation of the Phase II PDS is presented in Table 1. As shown in the table, mobilization for the field sampling activities is anticipated to occur within eight weeks of the submittal of this Work Plan to the USEPA and MDEQ. This period was selected to allow the USEPA and MDEQ sufficient time to review the proposed plan and allow the North Bronson PRP Group to bid the scope of work.

The initial field activities, including soil borings, monitoring well installation, groundwater sampling, and the first round of synoptic elevation measurements, are anticipated to require approximately five weeks to complete. Laboratory analyses and data validation will require approximately six weeks to complete. The estimated date for submittal of the Phase II PDS memorandum is approximately 28 weeks from submittal of this Work Plan to the agencies.

Three subsequent quarterly synoptic elevation measurements will be completed over a 9-month period. Quarterly data transmittal memoranda will be submitted to the agencies within three weeks of completing field activities.

In accordance with Sections III and IV of the Statement of Work (SOW), the North Bronson PRP Group will submit all raw data, including complete data packages and field and laboratory notes, to the USEPA and the MDEQ within seven days of receipt and validation. Data will be submitted on a continual basis as the field activities proceed and data is generated. To reduce complication, weekly submittals of all data

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and notes prepared and validated during the preceding week during which work has taken place are anticipated.

References

ARCADIS G&M, Inc. 2002. *Draft Conceptual Site Model* for Operable Unit 1, North Bronson Industrial Area Site, Bronson, Michigan. April 2002.

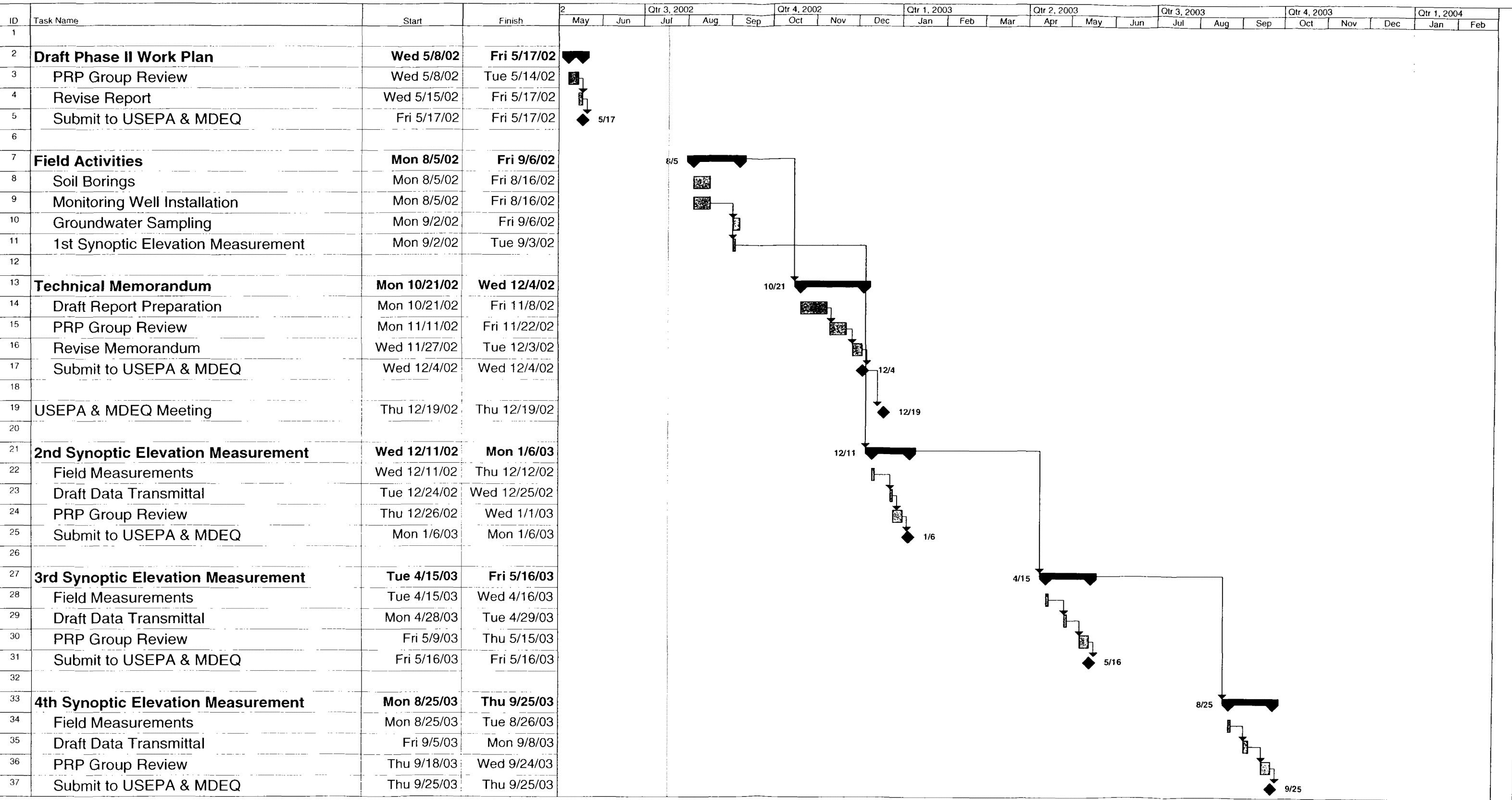
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ARCADIS G&M, Inc. 2000. *Field Sampling and Quality Assurance Plan*, Operable Unit 1, North Bronson Industrial Area Site, Bronson, Michigan.

Chemetrics. 2002. *Chemetrics 2002 Catalogue*.

TABLES

Table 1 - Proposed Phase II Pre-Design Studies Schedule, Operable Unit 1, North Bronson Area Industrial Site, Bronson, Michigan



Project: nbia phase ii pds schedule
Date: Thu 7/18/02

Task

Split

Progress

Milestone

Summary

Rolled Up Task

Page 1

Rolled Up Split

Rolled Up Milestone

Rolled Up Progress

External Tasks

Project Summary

FIGURES

(b) (6)

APPENDIX A

ARCADIS

Appendix A

Laboratory Procedures

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FIELD PROCEDURE GC/MS-100 VOA

ANALYSIS of VOLATILE ORGANIC COMPOUNDS BY EPA SW-846 METHOD 8260

SUMMARY OF METHOD:

Chromatographic retention times and unique ions identify volatile organic compounds (VOC's) in soil, groundwater, gaseous samples. Quantification of compounds is achieved by taking acquired response factors of these compounds and comparing responses to respective initial calibration response curves. Analysis of samples will be performed in batches of 20 field samples. A batch will consist of (at a minimum), a tune, a beginning CCV, followed by a method blank, 20 or less field samples, a sample matrix spike and matrix spike duplicate, and an Lab Control Spike (if needed to meet project requirements). All tunes and calibrations cycles are 12 hours long. A field duplicate, if requested by the client, is treated like a sample.

EQUIPMENT:

- Hewlett Packard 5890GC with a 5970 MSD
- Tekmar ALS2016 16 position autosampler
- Tekmar LSC2000 Purge & Trap Controller
- Computer equipped with Chemstation software
- DB624 30m. x .25mmID x 1.12 micron film (or equivalent)
- Disposable purge culture tubes
- 2 x 5 ml gas tight syringes
- 1 x 25 ml gas tight syringe
- 1 x 100 ml gas tight syringe
- Deionized water
- Helium ultra pure gas

1. SAMPLE HANDLING:

Upon receipt of the samples, the client enters the sample name on a Chain of Custody (COC). A lab ID number is then assigned from the sample-tracking log and the sample is refrigerated until the time of analysis.

1.1. Soil Samples

1.1.1. Method 5035

1.1.1.1. **Aqueous Preparation:** Weigh out 5 grams of soil in to the purge

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- 1 x 100 ml gas tight syringe
- Deionized water
- Helium ultra pure gas

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1.1. Soil Samples

1.1.1. Method 5035

1.1.1.1. **Aqueous Preparation:** Weigh out 5 grams of soil in to the purge

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and trap vessel. In a 5 ml air tight syringe add 5 ml reagent grade water. Internal standard and surrogates are added to the 5 ml syringe, then introduced into the purge vessel and the sample is purged.

- 1.1.1.2. **Methanol Preservation:** Weigh a 40 ml VOA with 10 mls of Purge and Trap grade methanol inside. Weigh out 10 grams of soil and sonicate for 20 minutes. Let particulate settle and extract 100 ul and add it to 5 ml of water. Internal standard and surrogates are added and the sample is purged. This is a 50 x dilution factor for any hits. Blanks for the methanol preservation method should have 100ul of methanol added and the 50 x dilution factor of the blank reporting limits is valid.

1.2. Water Samples

1.2.1. Method 5030

- 1.2.1.1. In a 5 ml air tight syringe add 5 ml of aqueous sample. Internal standard and surrogates are added to the 5 ml syringe, then introduced into the purge vessel and the sample is purged.

1.3. Sample Holding Times

1.3.1. Soils

- 1.3.1.1. For Method 5035 the standard holding time is 14 days. If methanol preservation is utilized the extract can be held up to 14 days.

1.3.2. Waters

- 1.3.2.1. For Method 5030 the standard holding time is 7 days.

- 1.4. Samples are analyzed in the order received or in the order of customer priority.

2. INTERFERENCES

- 2.1. Major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of non-polytetrafluoroethylene (PTFE) thread sealants, plastic tubing, or flow controllers with rubber components should be avoided, since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation. Analyses of calibration and reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in blanks, the analyst should change the purge gas source and regenerate the molecular sieve purge gas filter. Subtracting blank values from sample results is not permitted. If reporting values without correcting for

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the blank results in what the laboratory feels is a false positive result for a sample, the laboratory should fully explained this in text accompanying the uncorrected data.

- 2.2. Contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing high concentrations of volatile organic compounds. A technique to prevent this problem is to rinse the purging apparatus and sample syringes with three portions of organic-free reagent water between samples. After the analysis of a sample containing high concentrations of volatile organic compounds, one or more blanks should be analyzed to check for cross-contamination. Alternatively, if the sample immediately following the high concentration sample does not contain the volatile organic compounds present in the high level sample, freedom from contamination has been established.
- 2.3. Special precautions must be taken to analyze for methylene chloride. The analytical and sample storage area should be isolated from all atmospheric sources of methylene chloride. Otherwise, random background levels will result. Since methylene chloride will permeate through PTFE tubing, all gas chromatography carrier gas lines and purge gas plumbing should be constructed from stainless steel or copper tubing. Laboratory clothing worn by the analyst should be clean, since clothing previously exposed to methylene chloride fumes during liquid/liquid extraction procedures can contribute to sample contamination.
- 2.4. Use of sensitive mass spectrometers to achieve lower detection level will increase the potential to detect laboratory contaminants as interferences.
- 2.5. Direct injection - Some contamination may be eliminated by baking out the column between analyses. Changing the injector liner will reduce the potential for cross-contamination. A portion of the analytical column may need to be removed in the case of extreme contamination. The use of direct injection will result in the need for more frequent instrument maintenance.

3. PROCEDURE:

- 3.1. All equipment is powered up and allowed to reach temperature for optimal performance prior to tuning and calibration. (Roughly 2 hours minimum). The Tekmar LSC2000 is set for an 11-minute purge, 2 minute dry purge, 2 minute desorb at 250°, and an 8 minute bake-out at 260°. Line and valve temperatures are set at 225°. The standby temperature is set for 40°, and the desorb preset is set for 250°. Although specific settings may vary, the program is to be identical for each sample in

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a project.

- 3.2. From manual tune or diagnostic screen, ensure that the ions 18 (water) and 28 (N₂ from air) are less than 10% the response of ion 69 in the calibration gas (Print copy of air/water report for file.). From the manual tune screen, load the current tune values, Autotune, and manually tune the instrument to ions 69 (100%) 131 (35-40%), 219 (35-40%), and 502 (0.8-1.2%), and save tune values.
- 3.3. Return to Instrument control screen, and load a sequence keeping a sequential data file enumeration. Save the sequence as the current date, and inject 2 uls of 25ppm Bromofluorobenzene (BFB) via direct inject. This is the beginning of the tune, which must be performed every 12 hours of operation. From the data analysis screen load the BFB DI method and zoom on the BFB peak. With the right mouse button double-click on the peak to attain one individual scan. At the top of the screen key on "Tuner" and "Evaluate BFB" to determine if the BFB passed the Pass/Fail criterion established by the method (See Table 1). If any individual scan point does not produce a pass response for all criteria, using the right mouse button key on a scan and drag to another scan for an average of all scans within. When a scan or average of scans indicates all ions pass, print out a copy for the daily QC package. (Alternatively, the BFB tune evaluation can be performed utilizing the BFB peak from an analytical run [i.e. the initial method blank etc.])
- 3.4. Using the sequence and established methods for 8260, run a curve of no less than 5 points. An example of a typical curve would be:

Std. Conc.(ppb)	Int. Std. 25 ug/ml	Surr. 25ug/ml	Gas 25 ug/ml	8260 Std. 25ug/ml	2-Meth. 25 ug/ml	Final Vol.(mls)
1 ng/ml	50 ul	1 ul	1 ul	1 ul	1 ul	25 ml
5 ng/ml	50 ul	5 ul	5 ul	5 ul	5 ul	25 ml
10 ng/ml	50 ul	10 ul	10 ul	10 ul	10 ul	25 ml
20 ng/ml	10 ul	4 ul	4 ul	4 ul	4 ul	5 ml
50 ng/ml	10 ul	10 ul	10 ul	10 ul	10 ul	5 ml
100 ng/ml	10 ul	20 ul	20 ul	20 ul	20 ul	5 ml
200 ng/ml	10 ul	40 ul	40 ul	40 ul	40 ul	5 ml

Analyze the curve in the data analysis screen. Load the data file from the "File" menu on the top of the screen. Quantitate the data file using "Quant" and "Calibrate and Generate". Observe the validity of the quantitation using "Quant" and "Q-edit

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Quant Results”, watching for correct integration and peak identification. By clearing all calibration responses and points via the “InitCal” menu, the new curve is ready to be entered into the computer. Enter the “InitCal” menu and scroll to the “Update Levels” menu choice. Chose “Add New Level”, enter the calibration concentration as the level number, enter the calibration concentration, and the internal standard concentration. Click the “Do Update” button. Once all points are loaded, observe the quality of all component curves in the “Edit Compounds Screen”. Observe the average response factors, and time permitting, rerun any single point that is seemingly “not on the curve”.

- 3.5. There are 6 calibration check compounds (CCC's): Vinyl Chloride, 1,1-Dichloroethene, Chloroform, 1,2- Dichloropropane, Toluene, and Ethylbenzene.
- 3.5.1. The response factors must be < 30% RSD on an initial calibration.
- 3.5.2. All other compounds should be 15% or less. When all compounds can not attain the 15% criterion, an average of all compound percentages must be less than 15%.
- 3.6. There are 5 System Performance Check Compounds (SPCCs) and their minimum relative response factors must be: Chloromethane, 1,1 Dichloroethane, Bromoform > 0.1; Chlorobenzene, 1,1,2,2-Tetrachloroethane > 0.3.
- 3.7. A list of analyte RSD's and relative response factors (RF) should be accessed through the “InitCal” and “Response Factors to Printer”. Linear or non-linear regression may also be used (as per SW-846 Method 8000 Sec. 7) so long as the correlation coefficient is .99 or greater (print the plot for any compound in which linear or non-linear regression is utilized). This page should be placed in the main file. If any of the criteria are not met corrective action must be taken immediately. There are guidelines in SW-846 Method 8260B in section 7.4 for specific SPCC and CCC failures. When an acceptable initial calibration is attained, click “Save Method”, and enter “today's date.M”. A method blank must be run to show no contamination of compounds of interest above the reporting limit. With a good calibration and a good blank, samples may now be analyzed.

3.7.1. The RF is calculated as follows:

$$RF = \frac{A \times D}{B \times C}$$

where:

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A = Peak area (or height) of the analyte or surrogate.

B = Peak area (or height) of the internal standard.

C = Concentration of the analyte or surrogate.

D = Concentration of the internal standard.

3.7.2. The RSD is calculated as follows:

$$RSD = \frac{SD}{RF} \times 100$$

where:

SD = Standard Deviation

RF = mean RF for each compound from the initial calibration.

- 3.8. If a good curve was previously established, attain a good tune and run a continuing calibration verification (CCV) and a method blank before running samples. A CCV is a mid-point (usually 50ppb) standard that is present in each compounds ICAL. The criteria for a good CCV is that the CCC's must be < 20% RSD, and the SPCC's must maintain the relative response factor criteria. A print record of the CCV report is attained in "ContCal" and "Evaluate Data File as Continuing Calibration to Printer" in the data acquisition screen. If the criteria are not attained a new CCV or initial calibration must be run.
- 3.9. To add samples to the sequence table, click on the sequence screen, go to "Sequence" and "Edit Sequence Table". Highlight the last run in the sequence, and click the "Repeat" button. Change the sample name and add all pertinent information into the sample name box or the miscellaneous box. If more than one sample is to be loaded into the sequence repeat, and click the "OK" button when finished. If a sequence is not presently running, save the sequence.
- 3.10. All analyses receive an injection of 50ppb internal standard (10ul), and 50ppb surrogate (10ul).
- 3.10.1. The criteria for internal standards are -50% to +100% of the response from the CCV or the initial calibration.
- 3.10.1.1. Internal standard retention time - The retention times of the

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internal standards in the calibration verification standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from the that in the mid-point standard level of the most recent initial calibration sequence, then the chromatographic system must be inspected for malfunctions and corrections must be made, as required. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is required.

- 3.10.2. The criteria for surrogate recoveries are $\pm 30\%$. The data must be flagged for any sample not meeting the criteria and the sample must be reanalyzed.
- 3.11. Analyst judgement is crucial to estimate the amount of contamination prior to analysis. Any result greater than the highest standard must be diluted and reanalyzed after the system has been shown to be free of carryover contamination. All waters are to be analyzed undiluted, unless gross contamination is suspected. All soils using the 5035 methanol preservation are to be run at a 50:1 dilution (100ul into 5ml H₂O) unless gross contamination is expected. Efficient and continuous analysis is imperative. One sample should be purging while another is being analyzed.
- 3.12. When a sample is finished running, load the file from the data acquisition screen. Quantitate the sample by clicking on "Quant" and "Cal/Generate Report to the screen". Then from the "Quant" file, enter "Q-Edit Quant Results" and scroll through observing all peaks. All compounds that are identified should have a primary and a secondary ion present, and the integration should be on the x-axis. Evaluate all responses and report everything above the reporting limit. Use the "Q-Delete" button to remove any compounds that are below the reporting limit, or simply noise. When in doubt about calling a hit, if the ion pattern is similar to the compound of interest, call the hit. If a hit is obviously an artifact of a co-eluting peak do not call it. NEVER CUT OR SHAVE A PEAK. Manual Integration to include tailing is permissible and requires operator judgement.
- 3.13. Batch QC is vital to the success or failure of a project. In a daily tune cycle, (batches of 20 samples or fewer and run within 24 hours of the starting CCV), the following must be completed; 12-hour tunes, CCVs, method blanks (all < reporting limit), up to 20 samples (all surrogates pass), a matrix spike (MS), a matrix spike duplicate (MSD). An MS and an MSD are samples spiked with a known concentration of standard. The MS must be within 30% of the expected value, and the MSD must agree with the MS within $\pm 30\%$. A lab control spike (LCS) can also be run to prove matrix interference issues. All acquisition should be done within a 12-hour period.

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(On occasion, an MS and an MSD can be run the next periods tune and calibration cycle). If surrogates fail, rerun the sample later or on the next day. If surrogates fail twice, report analysis with appropriate flags for matrix affect.

- 3.14. The final sequence must be saved and included in the daily data package. The daily data package is to be placed in a file folder. The batch files will include the following order of paperwork: daily sequence, the continuing calibration or initial calibration report, the tune, the CCV or Initial Cal, the blank, all samples in order, the MS, the MSD, any reruns, IS report, and Batch QC check list. Circle any QC failures. Initial and date any changes on sheets.
- 3.15. Customer Reporting – see Data Processing Procedure DA-100 in the Standard Operating Procedures.

4. STANDARD PREPARATION:

- 4.1. Commercially available internal standards and surrogates are diluted with methanol from purchased standards to a working standard concentration of 25 ug/ml. UltraScientific, Accustandard, and Chemservice all have adequate 8260 internal standard mixes.
- 4.2. Commercially available gaseous analyte mixtures are diluted with methanol to a working standard concentration of 25 ug/ml. UltraScientific, Accustandard, and Supelco all have commercially-available gaseous analyte mixture of bromomethane, chloromethane, chloroethane, vinyl chloride, dichloro-difluoromethane and trichlorofluoromethane.
- 4.3. Commercially available 8260 main mixtures are diluted with methanol to a working standard concentration of 25 ug/ml. UltraScientific, Accustandard, and Supelco all have adequate 8260 mixes.
- 4.4. Commercially available 2-MethylNaphthalene and MTBE (or other unique project specific standards) are diluted with methanol to a working standard concentration of 25 ug/ml.
- 4.5. Frequency of Standard Preparation
 - 4.5.1. Standards for the permanent gases should be monitored frequently by comparison to the initial calibration curve. Fresh standards should be prepared if this check exceeds a 20% drift. Standards for gases usually need to be replaced after one week or as recommended by the standard manufacturer, unless the acceptability of the standard can be documented. Dichlorodifluoromethane and dichloromethane will usually be the first compounds to evaporate from the standard and should, therefore, be monitored very closely when standards are held beyond one week.

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4.5.2. Standards for the non-gases should be monitored frequently by comparison to the initial calibration. Fresh standards should be prepared if this check exceeds a 20% drift. Standards for non-gases usually need to be replaced after six months or as recommended by the standard manufacturer, unless the acceptability of the standard can be documented. Standards of reactive compounds such as 2-chloroethyl vinyl ether and styrene may need to be prepared more frequently.

5. REAGENTS:

- 5.1. Reagent grade inorganic chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all inorganic reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.
- 5.2. Organic-free reagent water - All references to water in this method refer to organic-free reagent water, as defined in SW-846 Chapter One.
- 5.3. Methanol, CH₃OH – Purge and Trap quality or equivalent, demonstrated to be free of analytes. Store apart from other solvents.

6. QUALITATIVE ANALYSES:

- 6.1. The qualitative identification of each compound determined by this method is based on retention time, and on comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met.
 - 6.1.1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

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- 6.1.2. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.
- 6.1.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.)
- 6.1.4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.
- 6.1.5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important.
- 6.1.6. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes co-elute (i.e., only one chromatographic peak is apparent), the identification criteria may be met, but each analyte spectrum will contain extraneous ions contributed by the co-eluting compound.
- 6.2. For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

For example, the RCRA permit or waste de-listing requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification. Use the

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following guidelines for making tentative identifications: (1) Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum. (2) The relative intensities of the major ions should agree within $\pm 20\%$. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%). (3) Molecular ions present in the reference spectrum should be present in the sample spectrum. (4) Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds. (5) Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

7. QUANTITATIVE ANALYSES:

- 7.1. Once a compound has been identified, the quantitation of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of that of a given analyte.
- 7.2. If the RSD of a compound's response factors is 15% or less, then the concentration in the extract may be determined using the average response factor (& R&F) from initial calibration data. See SW-846 Method 8000, Sec. 7.0, for the equations describing internal standard calibration and either linear or non-linear calibrations.
- 7.3. Where applicable, the concentration of any non-target analytes identified in the sample should be estimated. The same formulae should be used with the following modifications: The areas A and A should be from the total ion chromatograms, and x is the RF for the compound should be assumed to be 1. The resulting concentration should be reported indicating: (1) that the value is an estimate, and (2) which internal standard was used to determine concentration. Use the nearest internal standard free of interferences.

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TABLE 1

BFB (4-BROMOFLUOROBENZENE) MASS INTENSITY CRITERIA

m/z	Required Intensity (relative abundance)
50	15 to 40% of m/z 95
75	30 to 60% of m/z 95
95	Base peak, 100% relative abundance
96	5 to 9% of m/z 95
173	Less than 2% of m/z 174
174	Greater than 50% of m/z 95
175	5 to 9% of m/z 174
176	Greater than 95% but less than 101% of m/z 174
177	5 to 9% of m/z 176

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TABLE 2

ANALYTES	UNITS	QUANTITATION LIMIT
<u>Fluorobenzene IS</u>		
Dichlorodifluoromethane	ug/L	5
Chloromethane	ug/L	5
Vinyl chloride	ug/L	2
Bromomethane	ug/L	5
Trichlorofluoromethane	ug/L	5
Chloroethane	ug/L	5
1,1-Dichloroethene	ug/L	1
Methylene chloride	ug/L	5
trans-1,2-Dichloroethene	ug/L	1
MTBE	ug/L	5
1,1-Dichloroethane	ug/L	1
2,2-Dichloropropane	ug/L	1
cis-1,2-Dichloroethene	ug/L	1
Bromochloromethane	ug/L	2
Chloroform	ug/L	1
1,1,1-Trichloroethane	ug/L	1
Carbon tetrachloride	ug/L	1
1,1-Dichloropropene	ug/L	1
Benzene	ug/L	1
1,2-Dichloroethane	ug/L	1
Trichloroethene	ug/L	1
1,2-Dichloropropane	ug/L	1
Dibromomethane	ug/L	2
<u>Chlorobenzene-D5 IS</u>		
Bromodichloromethane	ug/L	2
cis-1,3-Dichloropropene	ug/L	1
Toluene	ug/L	1
trans-1,3-Dichloropropene	ug/L	1
1,1,2-Trichloroethane	ug/L	1
Tetrachloroethene	ug/L	1
1,3-Dichloropropane	ug/L	1
Dibromochloromethane	ug/L	2
1,2-Dibromoethane	ug/L	1
<u>1,4-Dichlorobenzene-D4 IS</u>		
Chlorobenzene	ug/L	1
1,1,1,2-Tetrachloroethane	ug/L	2
Ethylbenzene	ug/L	1
m & p-Xylene	ug/L	2
o-Xylene	ug/L	1
Styrene	ug/L	1
Bromoform	ug/L	2
Isopropylbenzene	ug/L	2
Bromobenzene	ug/L	2

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1,1,2,2-Tetrachloroethane	ug/L	2
1,2,3-Trichloropropane	ug/L	2
n-Propylbenzene	ug/L	2
2-Chlorotoluene	ug/L	2
4-Chlorotoluene	ug/L	2
1,3,5-Trimethylbenzene	ug/L	2
tert-Butylbenzene	ug/L	2
1,2,4-Trimethylbenzene	ug/L	2
sec-Butylbenzene	ug/L	2
1,3-Dichlorobenzene	ug/L	2
p-Isopropyltoluene	ug/L	2
1,4-Dichlorobenzene	ug/L	2
1,2-Dichlorobenzene	ug/L	2
n-Butylbenzene	ug/L	2
1,2-Dibromo-3-chloropropane	ug/L	5
1,2,4-Trichlorobenzene	ug/L	5
Hexachlorobutadiene	ug/L	5
Naphthalene	ug/L	5
1,2,3-Trichlorobenzene	ug/L	5
2-Methylnaphthalene	ug/L	5

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REVISION NO: 0

APPROVED BY:

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EPA 8260 Quality Control Check List

Quality Control	Frequency	Criteria
Tune Evaluation	Every twelve hours of run time (or every 24 hours for Method 624).	1) All BFB Specifications must fall within acceptable ranges.
Initial Calibration	As needed.	1) The average RFs for SPCCs as follows: Chloromethane and 1,1-DCA > 0.10; Bromoform > 0.10; Chlorobenzene and 1,1,2,2-Tetrachloroethane > 0.30. 2) The RF RSDs \leq 30% for all CCCs (Vinyl Chloride, 1,1-Dichloroethene, Chloroform, 1,2-Dichloropropane, Toluene, and Ethylbenzene), and the average of all others \leq 15% (Compounds using a regression calibration are not included in this average). 3) The correlation coefficient for each curve \geq 0.99.
Continuing Calibration Check	Daily; prior to analysis.	1) Internal Standard Areas between -50% and +100% of the areas observed in last CCV. 2) The average RFs for SPCCs as follows: Chloromethane and 1,1-DCA \geq 0.10; Bromoform \geq 0.10; Chlorobenzene and 1,1,2,2-Tetrachloroethane \geq 0.30. 3) The RF % RSD \leq 20% for all CCCs, and the average of all others \leq 15 %
Method Blank	Daily; prior to analysis.	1) Surrogate recoveries 70-130%. 2) Blank is free of target compounds \geq the reporting LOQ.
Laboratory Control Standard (LCS)	Daily; or once per analytical batch.	1) All project-required analytes recovered within 70-130%.
Surrogates	Each sample analysis.	1) Surrogate recoveries 70-130%.
Matrix Spike/Matrix Spike Duplicate	Daily; or once per analytical batch.	1) All project-required analytes recovered within 70-130%. 2) % RPDs \leq 20%

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Appendix B

Health and Safety Plan Updates

Emergency Contact Numbers

Police Emergency, Bronson:	911
Police Non-Emergency, Bronson:	(517) 369-9083
Branch County Sheriff:	(517) 278-2325
Fire Emergency, Bronson:	911
Fire Non-Emergency, Bronson:	(517) 369-6475
Ambulance, Bronson:	911
Life Care Ambulance Service, Bronson:	(517) 278-3091
Rescue Squad, Bronson:	911
Hospital Emergency†, Coldwater:	(517) 279-5437
Hospital Non-Emergency, Coldwater:	(517) 279-5400
	Community Health Center 274 East Chicago Street Coldwater, Michigan
Hospital Emergency, Kalamazoo:	(616) 341-6386
Hospital Non-Emergency, Kalamazoo:	(616) 341-7902
Hospital Burn Unit, Kalamazoo:	(616) 341-6485
	Bronson Methodist Hospital 252 East Lovell Street Kalamazoo, Michigan
Poison Control Center:	(800) 562-9781
MISS DIG System (Utility Staking):	(800) 482-7171

ARCADIS Contacts

Corporate Health & Safety Officer:	Pat Vollertsen (720) 344-3779
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Appendix B

Revised Health and
Safety Plan Emergency
Contact List

Directions to Hospital:

South on N. Matteson St. to U.S. Highway 12 (E. Chicago St.). East (left) on U.S. Highway 12 (E. Chicago St.) for approximately 10 miles to Community Health Center. Note that N. Matteson St. is the primary north/south road within the site.

†The Community Health Center triages and transports severely chemically burned patients to Bronson Methodist Hospital, Kalamazoo, Michigan.